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ABSTRACT

The use of cooperative learning at the college level was studied by investigating whether different instructor intervention approaches would affect the achievement of college students using cooperative learning methods. Subjects were 97 undergraduate elementary education majors enrolled in three sections of a curriculum course at the University of South Florida (Tampa) College of Education during the second semester of the 1990-91 academic year. Nineteen learning teams were formed and randomly assigned to treatment conditions as follows: (1) directions and materials provided, but no instructor assistance (control group); (2) instructors provided advance organizers; and (3) instructors met with groups after sessions to answer questions and provide assistance. All treatment groups read the same materials and followed a similar schedule of activities. A pretest was followed by a posttest and an attitude questionnaire after the 2-week period. On the posttest, the control and follow-up discussion groups had nearly identical mean scores, with the mean for the advance organizer group more than two points higher. Students liked the cooperative learning situation, believed they learned the materials well, and preferred instructor assistance to the control condition. Results suggest that advance organizers may yield greater learning than do follow-up discussions. Five tables present study findings, and a 17-item list of references is included. (SLD)

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A Comparison of Different Instructor Intervention Strategies in Cooperative Learning Groups at the College Level

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Paper presented at the annual meeting of the American Educational Research Association, April 20-24, 1992, San Francisco, California

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A Comparison of Different Instructor Intervention Strategies in Cooperative Learning Groups at the College Level

Introduction

Cooperative learning methods are being enthusiastically supported by hundreds of thousands of educators throughout the nation. This widespread adoption is partly due to the fact that the procedures can be adapted to a variety of purposes which serve a range of philosophical orientations. As well as facilitating academic outcomes, cooperative learning methods are seen as a way to promote positive self-esteem, prosocial behavior, and favorable attitudes toward school and learning. Cooperative learning approaches are seen as a possible means for dealing with difficult problems such as mainstreaming handicapped students and as an alternative to tracking.

There is both theoretical and empirical support for the practice of utilizing methods of cooperative learning in classrooms. Theoretically, the practice is supported by assumptions of both motivational and cognitive development models of learning (Slavin, 1990). Motivational theories associate reward or goal structures with the positive academic results of cooperative learning. In order to meet personal goals, students are required to help the group to succeed. Cooperative goals create norms that cause students to be motivated to do academic work.

Cognitive theories stress the positive effect of children interacting with peers as a method of facilitating intellectual development. Collaborative activity promotes growth because children have behaviors modeled in the group that are more advanced than they are individually able to perform. This modeling facilitates their mastery of critical concepts. Some cognitive theories emphasize the importance of cognitive restructuring in order for learning to occur. In cooperative learning, when students explain material to their peers, restructuring and elaboration are occurring.

In addition to compatibility with recognized theoretical models of learning, cooperative learning has received extensive acceptance in the educational community because it is supported by an excellent research base. Slavin (1989) states that "it has a vastly better research base than most innovations" (p.3). The meta-analysis of one hundred twenty-two laboratory and classroom studies conducted by Johnson, Maruyama, Johnson, Nelson, & Skon (1981) found that for all subject areas at all age levels cooperative learning procedures tended to promote higher achievement than other learning situations. Slavin's (1983) review of forty-six experiments found cooperative methods groups had significantly higher achievement than control groups in twenty-nine classrooms and no differences in fifteen classrooms. Only in two studies did the control groups have a slight gain over the cooperative learning classrooms.

More recent reviews of research continue to support the conclusion that cooperative learning offers great promise as an instructional strategy. A total of sixty studies reviewed by Slavin in 1990 revealed the effects of cooperative learning on achievement to be clearly positive: seventy-two percent of comparisons were positive and only twelve percent favored the control groups (Slavin, 1990). Similar findings were reported by Newmann and Thompson (1987) in their review of cooperative learning and achievement in secondary schools and by Davidson (1985) in his review of studies in the area of mathematics.

While there exist a large body of research documenting the positive effects of cooperative learning on many important educational outcomes, most of the studies have focused on grades three through nine. Relatively few studies have been examined cooperative learning at the senior high school level and even fewer studies have been conducted at the college level (Slavin, 1991).

Although cooperative learning methods are increasingly being used in college classrooms there is very little research at this level (Slavin, 1991). Furthermore, the findings at the college level are not as consistent as those for grades two through twelve. There is some evidence that conditions such as group incentives required for success at K-12 might not hold at the college level (Davidson, 1985). Slavin observes that one of the issues researchers need to address is the effects of cooperative learning at the college level (Slavin, 1989).

Purpose

This study was conducted to explore the use of cooperative learning at the college level. The primary purpose of the study was to determine whether different approaches of instructor intervention would affect the achievement of college students using cooperative learning methods. The two approaches of instructor intervention that were studied were the use of advance organizers and the use of follow-up discussion.

Schema theory serves as support for the use of advance organizers in cooperative learning procedures. This theory emphasizes that meaningful learning occurs when the ideas in a new schema are connected to each other and to previously established schemata (Ausubel, 1963). Many studies have established that advance organizers have positive effects on student achievement (e.g., Mayer, 1979).

Studies on lesson-end review and the use of postquestions in reading provide some support for the practice of providing follow-up discussion of study material. Wright and Nuthall (1970) found that review at the end of the lesson is positively correlated to achievement. Medley (1977) also found that structuring comments at both the beginning and end of a lesson related to increased student achievement. In comparing the effect of early and late reviews, Gay (1973) concluded that while both early and late reviews make a contribution to retention, the contribution of the late review is greater. In addition, it has been found that using inserted postquestions in reading instruction directs students' attention to

the type of information they were being asked and reinforces selective attention (Reynolds, Standiford, & Anderson, 1979).

The intent of the present study was to discover if the use of either of these approaches as a part of the cooperative learning methods makes a significant difference in student achievement and to compare these approaches to each other for significant differences in effect. In addition, a control condition providing no direct instructor intervention was included in the design.

An ancillary purpose of the study was to ascertain whether the different intervention approaches studied influenced either the subjects' cognitive level of achievement or perceptions and attitudes about their learning experience.

Method

Subjects

The subjects involved in the study were ninety-seven undergraduate elementary education majors enrolled in three sections of a curriculum course in the College of Education at the University of South Florida during the second semester of the 1990-1991 academic year. Nearly all participants were in the first semester of their junior year and were just beginning the professional training program. Of the ninety-seven students in the target population, eighty-nine were females and eight were males. All these students met the requirement of having a minimum SAT score of 840 or an EACT (ACT) score of 20 (19) in order to be admitted to the College of Education.

Procedures

An experimental design was used, in which the subjects were randomly assigned to treatment conditions. Within each class, cooperative learning teams were established by randomly assigning students from the class rosters. There were six teams in each of two class sections and seven teams in one section which had a large enrollment. Of the total nineteen teams, fifteen consisted of five members each. Due to differences in enrollments in class sections and attrition, three teams had six members and one team had four members.

Once the learning teams were formed, each was randomly assigned to one of the three treatment conditions. One treatment provided directions and materials during each class session but offered no instructional assistance by the instructor. This treatment was considered the control group. In another treatment, the instructor met with groups and provided advance organizers before the groups began to work together. The third treatment consisted of the instructor meeting with groups at the end of the session, after they had been working together, in order to answer questions and give assistance. The researcher served as the instructor for all three treatments.

Each treatment used a modified version of the Jigsaw II method of cooperative learning. In Jigsaw II (Slavin, 1990) students are assigned to teams with four to six members and all members of the group are assigned the same material to read. Each member in a group is designated as an "expert" for a portion of the material

and is asked to give special attention to that portion. The experts from different groups meet to discuss assigned material and then return to their groups to take turns teaching that material to their teammates. Finally, students take quizzes over all the material that was covered and an individual score is given on the quiz. Some type of group reward is given to those teams in which all members did well.

In this study, all treatment groups were given the same material to read. The material dealt with the topic of educational objectives. More specifically, the content focused on the nature of behavioral objectives, ways to state objectives correctly, and the classification of objectives in the Taxonomy of Educational Objectives (Bloom, 1956).

Students were asked to read assigned pages before coming to each class session. The section of material on which each member was to concentrate was randomly assigned.
Experts were encouraged to refine their understanding by working practice exercises in the section they were assigned.

Once students came to class, all treatment groups followed a similar schedule of activities. This schedule included expert group discussion, team reports, practice quiz taken by individuals, team discussion to reach consensus on answers to the practice quiz, and checking answers with a key. Expert group discussion consisted of having members from different teams who were assigned to the same treatment come together to discuss their portion of material and to plan how they might present the material when they returned to their teams.

Approximately twenty minutes of each class session was devoted to experts discussing their material and preparing how to present it in their teams. The team reports lasted thirty-five minutes. Groups took a ten minute break and then spent from seven to nine minutes taking a practice quiz. Ten minutes were reserved for the team members to compare answers to the practice quiz, discuss differences, and reach consensus. Checking answers and discussing discrepancies was allotted fifteen minutes.

No Intervention Treatment: After the instructor gave directions and posted a schedule with time allotments for various activities, those teams assigned to the no intervention (control) group used the entire two hour session to accomplish these activities. They did not meet with the instructor or receive any instructor assistance during the class session. The time they worked together on various activities was expanded to substitute for the time the instructor spent working with other treatment groups.

Advance Organizer Treatment: The instructor took the groups which were provided with advance organizers to an adjoining room and devoted 15 minutes to that purpose. Provision for advance organizers included clarifying the objectives of the learning task, relating the content to teaching experiences, identifying key ideas and underlying principles that would help generate logical relationships in the new material, and noting common problems and concerns students usually need to address when learning the material. After this time period, these teams followed the

sequence outlined for all groups: experts meet, team reports, practice quiz, consensus answers, and check answers.

Follow-up Discussion Treatment: The treatment groups which were provided with a follow-up discussion engaged in the same general sequence of activities that the other groups followed. The variation in treatment was that instructor assistance was provided at the end of each sequence of cooperative learning activities. During the last fifteen minutes of each session, teams assigned to this treatment met with the instructor to discuss their questions, problems, and concerns. The group could identify the agenda for the session as a result of problems arising from expert reports or answers to the practice quiz. Whenever the teams depleted their concerns and time remained, the instructor would pose questions related to key understandings. The teams assigned to this treatment were taken to an adjoining room so that the discussion would not be heard by other treatment groups.

The duration of the treatments was two weeks with a total of eight hours of instructional time. (Time required to administer the pretest and posttest was not counted as a part of the eight hours.) All groups met two times each week for a two hour session.

Certain limitations of the design of this study should be recognized and addressed. First, all three treatment conditions were conducted by one professor. While this design provides control over differences among instructors, the limitations to generalizability must be acknowledged. Second, the sample is

limited to undergraduate education majors at a single metropolitan university. The use of such a sample was judged to be acceptable for an exploratory study of this nature. Replications are certainly required for the results to be considered broadly generalizable. Third, the duration of the treatments (eight hours of instructional time) is notably less than that recommended by Slavin (1990). In the context of a one-semester college course, utilizing cooperative learning methods as the primary source of instruction for short units of work would seem to be more a typical practice than adopting these methods as the primary instructional approach for the entire semester. Finally, the design does not provide an absolute control group that receives the same content through methods other than those associated with cooperative learning (e.g., lecture). The purpose of the study was not to compare cooperative learning methods with alternative strategies, but to compare three roles of instructors within a cooperative learning procedure.

Instrumentation

Subjects completed a pretest on the content to be covered during the two week instructional unit. At the conclusion of the study, a posttest was administered along with an attitude questionnaire.

The pretest contained forty-five multiple choice items. The set of items were validated by asking two judges to determine if each item was related to the content in the instructional materials used as a part of the treatment. Each judge had previously used

the materials in teaching undergraduate courses. Only items which both judges agreed upon as being content valid were retained. Reliability was determined by applying the Kuder-Richardson formula 20. The reliability coefficient for the pretest was .609. This coefficient may underestimate the actual reliability due to the homogeneity of the population.

In addition to the forty-five pretest items, almost all of which required subjects to respond at an application or analysis level of the Taxonomy of Educational Objectives, the posttest was augmented by including an additional fifteen items written at the comprehension level. The purpose of these additional items was to determine the effects of the treatments on the cognitive level of achievement of the subjects. The posttest items were scrambled so they appeared in a different order from the pretest. The reliability coefficient of the posttest, using the Kuder-Richardson formula 20, was .679.

A survey of attitudes and perceptions was conducted by administering a two-part questionnaire. The first part contained a set of nine items with forced choice responses. Each participant was to respond to the relevant items for the treatment group to which she/he had been assigned. Questions about the degree to which the subjects believed they had gained knowledge through cooperative learning methods, whether they liked or disliked the approach they experienced, how well the group worked together, the effectiveness of the Jigsaw II plan, and reactions to the instructor's intervention were asked on Part I. Part II of the

questionnaire used an open-ended format with subjects being asked to give comments about what they liked best and least about their cooperative learning experience and what changes would make the treatment they received more effective.

Statistical Analysis

The achievement data were analyzed using a hierarchical analysis of covariance. The hierarchical (nested) approach was taken because cooperative learning groups (rather than individual students) were randomly assigned to treatment conditions, and because the treatments were administered to the groups of students. The use of random assignment of the groups to treatment conditions avoids many of the statistical pitfalls associated with covariance analysis (Elashoff, 1969).

Following a procedure recommended by Hopkins (1982) and Kennedy and Bush (1985) for hierarchical analyses, the statistical significance of the differences among cooperative learning groups nested within treatments was evaluated first. Because this source of variation was not significantly different from zero ($F(16,77) = 1.37$, $p>.05$), the sums of squares and degrees of freedom were pooled with the residual error, and the statistical significance of the treatment effects were tested using this pooled estimate of error variance. Three analyses were conducted to test the effects of the treatments on (a) posttest total score, (b) a posttest score consisting of performance on only the comprehension level items, and (c) a posttest score consisting of performance on only the analysis level items.

Findings

Descriptive statistics for the pretest and the total posttest scores are provided in Table 1. A test for group mean differences on the pretest, showed no significant differences among the groups ($F(2, 94) = 2.59$, $p>.05$). This test served only to confirm that the random assignment of cooperative learning groups to treatments had yielded an equitable distribution of subjects' prior knowledge of the content. On the posttest, the no intervention and follow-up discussion groups revealed nearly identical mean scores, with the mean for the advance organizer group being more than two points higher.

Table 1

Pretest and Posttest Group Means and Standard Deviations for Total Examination.

Student Group	N	Pretest Mean	Pretest Std Dev	Posttest Mean	Posttest Std Dev	Adjusted Posttest Mean
No Intervention	30	21.53	5.25	35.27	4.80	35.01
Follow-up Discussion	31	19.26	5.23	35.26	4.57	35.81
Advance Organizer	36	21.55	4.28	37.61	3.24	37.35

The analysis of covariance conducted on these data (Table 2) shows a significant effect for treatments after adjusting for pretest performance. Pairwise comparisons of the adjusted group means (Table 1) shows a significant difference between the advance organizer group and the no intervention group ($t = 2.46$, $p<.05$), but no significant differences in the other pairwise comparisons.

Table 2

Analysis of Covariance for Total Examination.

Source	df	SS	MS	F	p
Covariate	1	315.122	315.122	21.29	0.0001
Treatment Group	2	93.907	46.954	3.17	0.0465
Error	93	1376.228	14.798		
Total	96	1785.258			

Descriptive statistics for the posttest scores computed separately for the Comprehension and Analysis level items are presented in Table 3. The highest mean scores for both levels of items were obtained by the advance organizer group (achieving means of 21.97 and 15.63 for the analysis level and comprehension level items, respectively). The differences in group means between the follow-up discussion group and the no intervention group was negligible for both sets of items, although a one-point mean difference was obtained for the analysis level items after adjusting for pretest scores (adjusted means in Table 3).

Table 3

Posttest Group Means and Standard Deviations for Analysis and Comprehension Items.

Student Group	N	Cognitive Level of Test Items: Analysis Mean	Analysis SD	Analysis Adj. Mean	Comprehension Mean	Comprehension SD	Comprehension Adj. Mean
No Intervention	30	20.73	3.78	20.56	14.53	2.44	14.45
Follow-up Discussion	31	21.19	3.72	21.57	14.06	1.86	14.24
Advance Organizer	36	21.97	3.02	21.79	15.63	1.92	15.56

The analyses of covariance for the comprehension items and the analysis items are presented in tables 4 and 5, respectively. A significant treatment effect was obtained for the comprehension

level items, but not for the analysis items. Pairwise comparisons between the adjusted means for the comprehension level items showed significant differences between the advance organizer group and both of the other treatment conditions ($t = 2.21$, $p<.05$, for the comparison with the no intervention group; $t = 2.61$, $p<.05$ for the comparison with the follow-up discussion group), but no significant difference between the follow-up discussion group and the no intervention group ($t = 0.41$, $p>.05$).

Table 4

Analysis of Covariance for Comprehension Items.

Source	df	SS	MS	F	p
Covariate	1	39.215	39.215	9.61	0.0026
Treatment Group	2	33.300	16.650	4.08	0.0200
Error	93	379.361	4.079		
Total	96	451.876			

Table 5

Analysis of Covariance for Analysis Items.

Source	df	SS	MS	F	p
Covariate	1	132.008	132.008	12.10	0.0008
Treatment Group	2	27.213	13.606	1.25	0.2921
Error	93	1014.552	10.909		
Total	96	1173.773			

An ancillary purpose of the study was to ascertain whether the different approaches studied influenced the subjects' perceptions and attitudes about their learning experience. Data relative to this purpose were collected using a two part questionnaire. Part I of the questionnaire asked participants to respond to a set of forced choice items concerning attitudes and perceptions. Part II of the questionnaire consisted of three open-ended questions for subjects to answer.

All subjects were asked to indicate to what degree they believed they gained information about the topic studied as a result of using cooperative learning methods. A satisfactory or high level of mastery was reported by most participants. More subjects in the advance organizer treatment (89.2%) responded

with either a satisfactory or high level of mastery than the subjects in the other two treatments (83.9% of the control group and 73.4% of the follow-up discussion groups).

When asked how subjects liked or disliked their cooperative learning experience, from 70% to 80% of the entire population responded in the two highest categories, i.e., "strongly liked" or "moderately liked".

Because all treatment conditions were based upon the Jigsaw II model of cooperative learning, subjects were assigned to read all the material before taking a special section to report on as an expert. Consequently, one question in Part I of the attitude survey asked the subjects to rate the necessity of each individual reading all the material when classmates taught each section. (Jigsaw I only has each group member read the portion for which he/she will serve as an expert.) The three forced choices were "extremely necessary," "somewhat necessary," and "unnecessary". From 50.0% to 64.5% of the responses were in the "extremely necessary" category. Only from five to ten percent of subjects responded that reading all the material was "unnecessary".

Another question on the attitude survey dealt with how well the subject believed her/his group worked together. The groups with no instructor intervention reported the highest degree of cooperation (80.6%). In contrast, the degree of cooperation reported by the advance organizer and follow-up discussion groups was 62.2% and 53.5% respectively.

Likewise, when asked to rate the preparedness and helpfulness of group members, the groups without instructor intervention responded more frequently at the highest level, i.e., "extremely well and helpful," 35.5%. Only 24.3% of the advance organizer and 16.7% of the follow-up discussion subjects responded with this rating.

The final four questions on Part I of the attitude survey explored the role of the instructor in cooperative learning. When the control group was asked whether they needed the professor's help, 83.9% responded that "some help" was needed.

When the groups that had instructor intervention were asked to specify the degree to which the intervention was helpful, responses were somewhat similar. Thirty percent (30.0%) of the subjects in the follow-up treatment replied that the assistance was "extremely helpful" and 27.0% of participants in the advance organizers indicated the same. Most responses fell into the category of "somewhat helpful": 53.5% of responses of subjects in the follow-up treatment and 43.2% of responses of subjects in the advance organizer treatment.

The majority of responses (56.7%) from subjects in both treatment groups receiving instructor intervention indicated the instructor involvement was about right. Most other responses (29.7% to 36.7%) indicated there was insufficient instructor intervention.

When asked whether the instructor's involvement was at the best time in the learning sequence, both treatment groups were

similar in saying the involvement was at the best time: 43.3% for the follow-up group and 35.1% for the advance organizer group. However, 43.2% of the subjects in the advance organizer groups indicated that more help was needed throughout the process as compared to only 26.7% of the subjects in the follow-up discussion groups.

The second part of the attitude questionnaire posed three open-ended questions to the participants. Subjects were asked what they liked the best and least about cooperative learning and changes they would make in cooperative learning methods.

A review of the responses to the question concerning what subjects liked best about cooperative learning revealed that the most frequent answer centered around an opportunity to interact with other people. A variety of reasons were cited relative to this general reaction: more interesting, more enjoyable, more helpful, use own words to discuss material, additional ideas and examples, other viewpoints, active participation.

A frequently occurring response relative to "least liked" aspects of cooperative learning was that there was too much material and too little time. Another reaction often noted was that subjects could not discuss material with the instructor or did not have enough instructor help. Changes recommended by subjects primarily focused on having more time to cover the material and increasing teacher availability.

Discussion

The analysis of the achievement test performance provides empirical support for differences in student performance among the three levels of instructor intervention examined in this research. The mean scores of students who received intervention prior to work within the cooperative learning groups (advance organizer) were higher than the mean scores for students receiving no instructor intervention when both the total posttest and only the comprehension level items were examined. Additionally, the advance organizer group posttest mean score on the comprehension level items was significantly higher than the mean for the follow-up discussion group. No significant differences among the treatment groups was evident when only the analysis level posttest items were analyzed.

Because the posttest used in this research contained more items than the pretest, an index of the effectiveness of the cooperative learning treatments can be obtained through student performance on the forty-five items that were common to the two test forms. For the no intervention group, the mean pretest performance was 48% of the test items, while the mean posttest performance was 78% of the same set of items (an increase of 30%). For the follow-up discussion group, an average of 43% of the items were correctly answered on the pretest and a mean of 78% on the posttest (an increase of 35%). Finally, the advance organizer group correctly answered an average of 48% on the pretest and 84% on the posttest (an increase of 36%). These

increases of 30% to 36% suggest that a respectable amount of learning occurred in all three of the cooperative learning groups. In addition, the empirical support for instructor intervention is evident in the differences in gains observed between groups.

The findings from the two-part questionnaire offer some insights into college students attitudes toward cooperative learning methods in general and toward the particular approaches utilized in this study. The perception by most of the participants that they had mastered the material at a satisfactory or high level indicates a confidence on the learner's part that cooperative learning methods work for certain tasks. In addition, the fact that approximately three-fourths of all subjects indicated that they liked or strongly liked this method of learning is significant. Reasons listed in the open-ended part of the questionnaire provide an understanding for this reaction. Students want to be active in the learning process and to interact with others. The opportunity of being exposed to a variety of viewpoints is seen as a major advantage. One student reported a like for cooperative learning because one was able to "...see how other people think and reach their conclusions."

Reasons for disliking cooperative learning methods seemed to center to a large degree around the specific conditions of this study. Subjects reported that they felt rushed at times and had too much material to cover in the allotted time. The control group cited the lack of assistance from the instructor as a major reason for their dislike.

From responses to the questionnaire, it seems apparent that having students read all the material before attempting to learn the material from peers in a group setting is viewed by college students as very necessary. An average of fifty-eight percent of the students from the three treatment groups indicated it was extremely important to read all the material. This result supports the Jigsaw II model over the original Jigsaw model of cooperative learning in which students only read the section of material for which they were responsible as an expert.

From the results of this study, it seems that all cooperative learning groups thought they worked well together. Upon further analyses, it is evident that the groups which had no instructor intervention reported more effective group functioning. Superior functioning was reported by the no intervention groups in terms of how well their group worked together, group members' preparedness, and helpfulness of group members. A possible explanation for this result is that without instructor intervention, groups are more self-reliant. The members realize they must solve their own problems and must depend upon each other for any support.

While instructor intervention might have negative effects on group functioning, some assistance by the instructor appears to be highly desired by a large portion of the subjects. Of those students not receiving instructor help with the new material, 83.9% indicated some help was needed. Of those who did receive instructor help, the groups receiving follow-up discussions

perceived this intervention as more helpful and timely than the groups receiving advance organizers. Note that these perceptions are at odds with test performance. Perhaps what is at work here is the principle of closure. Students tend to want to have conclusions confirmed by an instructor before moving on to new material.

In summary, college students in this study perceived cooperative learning groups as a method of learning which enabled them to acquire knowledge. Furthermore, they believed they worked together well when using the methods and had a very favorable attitude toward this approach. The model of cooperative learning which college students in this study indicate is most productive for them is one in which all students need to read all the material to be learned and the instructor is involved throughout the learning process, especially at the end of the learning sequence. Empirical findings of the study support the importance of instructor intervention but suggest that providing advanced organizers may yield greater learning than follow-up discussions.

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